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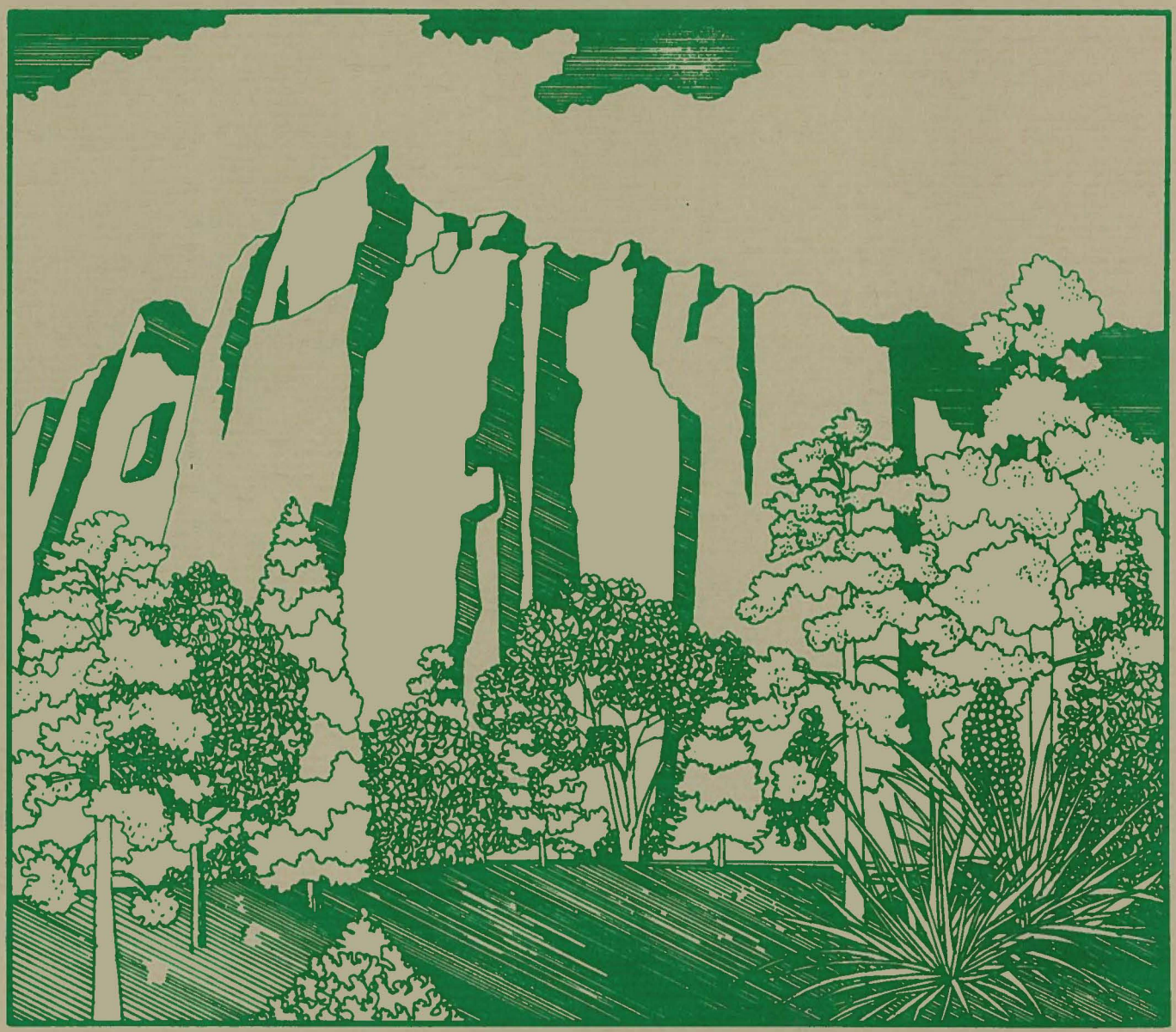
R-3 90-1

BIOLOGICAL EVALUATION OF PEST CONDITIONS AND POTENTIAL HAZARD TREES IN SELECTED CAMPGROUNDS ON THE BRADSHAW RANGER DISTRICT, PRESCOTT NATIONAL FOREST, ARIZONA

MARCH 1990



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BIOLOGICAL EVALUATION OF PEST CONDITIONS AND POTENTIAL HAZARD TREES IN SELECTED CAMPGROUNDS ON THE BRADSHAW RANGER DISTRICT, PRESCOTT NATIONAL FOREST, ARIZONA

MARCH 1990

By

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Appreciation is extended to Todd Ralls, Todd Snyder, and Mindy Schlimgen for assistance in field work.

INTRODUCTION

In 1989, Forest Pest Management in Region 3 initiated an insect and disease incidence survey of recreation sites. These surveys were conducted to evaluate the overall "health" of proposed and existing campground (CG) areas on the National Forests. John Holt, District Ranger, supplied a list of campgrounds to evaluate on the Bradshaw Ranger District (RD). The areas surveyed included:

Granite Basin CG
Granite Basin Picnic Area (PA)
Thumbe Butte PA
Upper Wolf Creek CG
Lower Wolf Creek CG
Hazlett Hollow CG
Kentuck Springs CG
Turney Gulch CG

All of the recreation sites surveyed are planned for reconstruction over the next five years.

OBJECTIVES

The objectives of this survey were to: (1) Evaluate and document the incidence of insect and disease activity and damages in recreation sites scheduled for reconstruction, and (2) detect and document hazardous trees in these recreation sites.

METHODS

The procedures followed are described in the "Inventory of Insects, Diseases, and Hazard Tree Incidence Work Plan for Developed and Proposed Recreation Sites of National Forest System Lands, Southwest Region" (Rogers, 1989). The study within each recreation area was two part; a hazard tree analysis and an insect and disease survey. The hazard tree analysis was patterned on procedures described by Johnson (1981). A hazard tree is defined as any tree with both a mechanical defect that could cause the tree to fail and a potential target. Only trees showing structural defects and located in areas of intensive public use, e.g. within and adjacent to camping sites, toilets, and parking pads, were evaluated. The individual tree data included: Species, diameter inside bark (DIB), location, defect, and hazard rating, which was recorded on a Tree Hazard Evaluation Form (see Appendix).

The hazard rating system used is a two-part failure/risk rating system, each part using a descriptive rating scale of High (H), Medium (M), and Low (L) to estimate probability. The first part of the rating system is an estimate of the probability of mechanical failure of the tree, or major portions of the

tree, within the next five years. This estimate is based on a number of factors including: presence of decay, condition and location of roots and crowns, and amount of lean. The second part of the rating is an estimate of the probability of injury to people or damage to property if the tree does fail. Only trees located in areas more likely to be occupied by people or property (risk rating = high or medium) were recorded on the evaluation forms.

The insect and disease survey was a 100 percent survey, conducted concurrently with the hazard tree analysis. The following data were collected for each tree showing signs of insect, disease, or abiotic damage: Species, diameter at breast height (DBH), height, tree history, a damage code, and a code for dwarf mistletoe rating (DMR) (Hawksworth, 1977). The data was recorded on the Region's Forest/Stand Tree Record Sheet.

Three of the recreation sites; Hazlett Hollow, Kentuck Springs, and Turney Gulch, are located in what is known as the Horsethief Basin recreation area and were evaluated for dwarf mistletoe (DM) infection by different methods than listed above. Forest Pest Management funds supported suppression projects in these recreation sites in 1971-72 and 1980 (unpublished reports). In 1970, DM-infected trees were tagged and later pruned or felled, depending on severity of infection, in order to increase health and longevity of the trees in these high value sites. During the recent survey, the following data were collected from each tagged tree in the residual stand: Species, DBH, and DMR (Hawksworth, 1977). This information was compared to data collected from the original unpublished survey completed by FPM in 1970, as a way of determining the effectiveness of past treatments.

RESULTS AND DISCUSSION

The sites surveyed are composed primarily of ponderosa pine with various species of hardwoods including; Gambel oak, emory oak, alligator juniper, Rocky Mt. juniper, and black walnut. A total of 44 hazard trees were recorded in the eight recreation sites surveyed. The number of trees per site in each rating class or category are listed in Table I. The majority of trees examined were dead or had dead tops or limbs and were rated in the medium failure/high risk category. Both hardwoods and conifers were defective. The majority of defective trees in Kentuck Springs, Granite Basin PA, Upper and Lower Wolf Creek CG, and Thumbe Butte PA were hardwoods (e.g. oak, juniper, and walnut), though pine represented the major vegetation component on all of these sites. Dead tops and branches in hardwood trees are potentially more dangerous than in conifers due to the wide spreading nature of their crowns. Specific information on recorded hazard trees and their location is supplied in the Tree Hazard Evaluation Forms for each site in the Appendix. Lower Wolf Creek, Thumb Butte, and Turney Gulch sites had the highest number of potential hazard trees. The thirteen hazard trees recorded at Turney Gulch were the result of recent mortality due to western pine beetle activity. These trees were given a medium risk rating due to their proximity to temporary structures and public access areas.

Table 1. Summary of the number of hazard trees in each rating class by recreation site surveyed on the Bradshaw RD.

	Number of Trees with Rating of:					
Campground	H/H[a]	M/H	H/M	M/M	L/H	TOTAL
Granite Basin PA		2				2
Granite Basin CG	2	1				3
Thumb Butte PA	3	6				9
Upper Wolf Creek GC	2					2
Lower Wolf Creek CG	4	2	1	1		8
Hazlett Hollow CG		2	1		1	4
Kentuck Springs CG		2			1	3
Turney Gulch Group CG		1		12		13
Total	11	16	2	13	2	44

PA = Picnic Area; CG = Campground; GC = Group Camp

[a] Failure/Risk Rating: H = High; M = Medium; L = Low

The hazard ratings provided are not recommendations for action. They are a professional estimate of the probability of tree failure and should be used by the land manager during the decision-making process for management plans in recreation areas.

The only insect and disease activity (other than hazard trees) found was caused by western pine beetle (Dendroctonus brevicomis) and southwestern dwarf mistletoe (Arceuthobium vaginatum subsp. cryptopodum) in the Horsethief Basin recreation sites. As previously mentioned, western pine beetle activity was present in the Turney Gulch site, resulting in two pockets of eight to ten dead trees, whose diameters ranged from 6.5 to 17 inches. In aerial detection survey reports since 1974, bark beetle mortality in the Horsethief Basin area has shifted from attack on smaller diameter trees by the pine engraver beetle (Ips spp.) (Acciavatti, 1974) to attack on larger diameter trees by western pine beetle. The trees killed are typically located on poorer sites and are heavily infected with dwarf mistletoe. The areas attacked in Turney Gulch CG appeared to be more densely stocked but no stand exam was performed in this study. Thinning densely stocked areas is advised to protect this and other sites from further mortality.

The results of the dwarf mistletoe surveys in Hazlett Hollow, Kentuck Springs, and Turney Gulch are shown in Table II. The DM ratings had decreased overall from the 1970 survey, the trees appear healthy and infection is light. This contrasts a similar survey conducted in Mingus Mountain CG (Wilson and Fairweather, 1990), on the Verde RD, in which the DM ratings increased overall from a 1970 survey. The DM ratings at Mingus Mountain CG were initially

higher, less of the crown was left on the trees after pruning, and the campground exists on a harsher site. The Mingus Mountain DM Suppression Project had only one treatment in 1971 and there was no followup treatment in 1980 as in the Horsethief Basin Project.

If left untreated, DM infection typically increases one rating in a ten year period, depending on initial intensification (DMR) (Lightle and Hawksworth, 1973). Based on the fact that the ratings on the residual infected trees in the Horsethief Basin recreation sites decreased or remained nearly the same over a 20 year period, the suppression project is considered successful. It appears that DM suppression treatments are not needed at this time but a re-evaluation of the area is recommended in five years.

TABLE II. Average dwarf mistletoe ratings of tagged-infected trees in and 1989 in some recreation sites on the Prescott National Forest.

	Average DM Rating*	
RECREATION SITE	1970	1989
HORSETHIEF BASIN AREA:		
Hazlett Hollow	1.62	1.39
Turney Gulch	1.89	2.04
Kentuck Springs	2.06	1.33
Mingus Mountain	2.29	3.91

*Based on Hawksworth's 6-class dwarf mistletoe rating system.

BIOLOGY OF PESTS

Southwestern Dwarf Mistletoe - Arceuthobium vaginatum subsp. cryptopodum:

Southwestern dwarf mistletoe (SWDM) is the most damaging disease of southwestern ponderosa pine, Pinus ponderosa var. scopulorum Engelm, (Hawksworth, 1961). Dwarf mistletoes are parasitic, seed-bearing plants that depend on their hosts almost completely for their water and nutrients. The disease spreads by explosively released seeds which are expelled to distances ranging from 10 to 40 feet. Seeds of SWDM are released in late July and early August. Infection follows a few months after dispersal, most taking place through the bark on needle-bearing portions of twigs. Dwarf mistletoes first produce an endophytic system, a specialized root-like structure that is in contact with the phloem and xylem of host trees, from which the parasite obtains most of its nutrients and water. The aerial shoots appear between two to five years after infection; this period of infection before shoots are visible is known as the latent period.

The disease causes mortality and growth reduction in infected trees: A decrease in the quantity, quality, and germination percentage of seeds produced; and lowers timber quality. Severely infected trees are more susceptible to attacks by insects and other diseases and to environmental stresses such as drought. Heavily infected trees (DMR = 5 or 6) may sustain a 20 to 50 percent reduction in growth when compared to uninfected trees and their life expectancy is severely decreased (Lightle and Hawksworth, 1973).

Dwarf mistletoe infects trees of all ages and is thus a problem in second growth and regeneration, as well as mature and overmature stands.

Spread of SWDM is a function of stand density, age, and site index, and averages one to two feet a year. Spread is most efficient and rapid from an infected overstory to an understory and slowest through an even-aged stand. Management of SWDM is directed toward decreasing spread and intensification of disease since DM eradication is achieved only by removing the entire stand of trees.

The following suggestions for DM control in recreational forests are offered based on a 20 year study by Lightle and Hawksworth (1973):

-Pruning is recommended in lightly infected trees (DMR <3). Remove branches two whorls above highest DM-infected branch to insure against latent infections. No more than 50% of the live crown should be removed.

-Confine pruning to more isolated trees. Repruning has been required in densely stocked stands due to numerous latent infection in areas initially considered lightly infected.

-Infected branches should be cut off at the bole in order to insure removal of the endophytic, root-like, system in the host tissue.

-Trees with bole infections do not need to be killed since bole infections are not vigorous.

-Pruning witches brooms on heavily infected trees (DMR = 3-4) does prolong life. A shorter life expectancy corresponds to higher DMR.

Other management strategies include:

-Sanitize densely stocked stands. The most severely infected trees are removed to eliminate much of the inoculum and promote vigor of lightly and noninfected trees.

-Remove severely infected overstory trees. A vegetation management plan is desirable, with emphasis on nonhost species eventually replacing DM-infected trees.

-Apply ethylene-releasing chemicals to promote abscission of DM aerial shoots (Beatty, et.al., 1988; Nicholls, et.al., 1987). This method greatly reduces seed dispersal; the pathogen is not eliminated since the endophytic system remains viable within the host tissue and new aerial shoots form in two to five years. Chemicals need to be reapplied every few years, making this method suitable to high value areas only where susceptible trees have become established under an infected overstory.

Western Pine Beetle-Dendroctonus brevicomis:

Western pine beetles mass-attack stands of ponderosa pine, carrying and transmitting fungi which aid in killing the host. Western pine beetles produce

between two and four generations per year depending on latitude and elevation. Flight and attacks start in late spring or early summer and continue until the onset of cold weather (DeMars, 1982). Western pine beetle attacks are initiated by adult females, usually at mid bole. Evidence of attack is marked by white to reddish pitch tubes on the bark. The attack process is mediated by chemical messengers or pheromones released by the beetles in combination with host terpenes. The beetles excavate winding sinuous egg galleries under the bark which often cross. Eggs are laid in niches chewed into the sides of the gallery. Once the eggs hatch the larvae feed in short galleries perpendicular to the parent gallery. Later larval stages feed in the middle bark. Pupation also occurs there. Brood adults first feed in the middle and outer bark before emerging. This cycle varies in length from two to ten months depending on temperature.

This insect usually breeds in scattered, slow growing overmature trees and diseased or damaged trees. Group killing is also common in dense, overstocked stands of young sawtimber. Trees under six inches in diameter are seldom attacked. Environmental stresses which permanently weaken individual or small groups of trees (root diseases, mistletoes, mechanical damage) or temporarily weaken whole stands (droughts, defoliators, fires) predispose trees to attack and create conditions for outbreaks to occur. A good example was documented in southern California where effects of ozone damage were examined. Beetle productivity was greater in ozone damaged trees since fewer attacks were required to kill the tree. The ratio of brood emergence to attacking beetles was greater for the ozone affected trees.

There are a number of natural enemies of this insect including woodpeckers, and several parasitic and predatory insects. However, the main factor thought to influence occurrence of outbreaks is the abundance of suitable hosts. Suppression of western pine beetle populations has often been found to be expensive and unsatisfactory since timely spotting and treatment is difficult. However, sanitation-salvage logging can be applied to minimize losses. Prevention of outbreaks is the most effective way of reducing losses. Unacceptable losses can be prevented in most circumstances (barring severe drought) by maintaining thrifty, vigorous trees. Thinning dense 70-80 year old sawtimber stands, thereby reducing stocking to 55-70 percent of the basal area necessary for full site utilization, relieves competitive stress among remaining trees, making them less prone to successful attack.

Individual high value trees that are predisposed to attack by temporary injury may be given a protective residual bark spray to prevent successful attack. Such treatment can be effective if the protection for one or two years would allow the tree to recover. It should not be considered for trees suffering from severe root disease or damage.

MANAGEMENT ALTERNATIVES

1. Do nothing. Trees rated as potential hazards will continue to decline and the probability of failure will increase. Trees will continue to be damaged by campers and by natural causes, so the number of potential hazards will also increase. The possibility of tree failure with property damage and injury to people will increase. Dwarf mistletoe-infected trees will continue to decline in health and vigor and serve as inoculum for spread and intensification of

disease. Risk of mortality will exist on densely stocked sites with severely DM-infected trees due to susceptibility to attack by bark beetles.

2. Remove or lessen the probability of failure of hazard trees. This alternative would involve removing trees that have been identified as potential hazard trees. In many cases, pruning dead branches and large brooms would substantially reduce the probability of failure. The land manager must decide the level of risk acceptable in an area and hazard trees would be removed or treated until that risk level is reached.

3. Remove the targets. Under this alternative, campgrounds or selected areas within campgrounds that are identified as targets are closed to public use. Removal of potential targets will remove the problem of hazard trees.

4. Develop a vegetation management plan based on objectives developed for the site, which reduces incidence of insect and disease and development of hazard trees. This may include activities such as: Thinning a dense stand of trees which reduces stress and probability of bark beetle attack; sanitizing to decrease the incidence of dm infection; pruning dm-infected trees to prolong life; and planting nonhost species under an infected ponderosa pine overstory.

5. A combination of alternatives 2 and 3 and 4. These alternatives are not mutually exclusive and can be used in combination to solve specific problems in many areas.

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APPENDIX A

TREE HAZARD EVALUATION

EXHIBIT 8

Administrative unit BRADSHAW RD

Examined by TODD

Site name GRANITE BASIN CG

Date 8-2-89

Campground or Picnic Unit No. 1	Tree location (azimuth and distance from fixed object)[1]	Species	DIB	*See abbreviations Type of defect: Leaning (angle of lean °)	Uprooting, root rot, butt rot, basal cavity	Bole wounds, bole cankers, decay (conks)	Weak fork, limb defect, brooms, dead top	Potential targets: Permanent structure, parked vehicle, people	Temporary structure, high-use trails	Low-use trails, signs	Failure rating[2]: High	Medium	Low	Risk rating[3]: High	Medium	Low	Additional comments	Actio 10
	Abbreviations: TO=Toilet, TB=Table, FR=Fire ring, PP=Parking pad, TP=Tent Pad, WH=Water hydrant, BG=Bridge, TC=Trash can, TD=Trailer dump																*Defect abbreviations: RR=Root rot, BR=Bole or butt rot, BW=Bole wound, BC=Basal cavity, LD=Limb defect, WF=Weak fork, C=Conk(s), DT=Dead top, ER=Exposed roots	
3	262° 34' FR	PP	26			X		X				X		X			Lighting scar w/BC & DT	
10	164° 127' TB	PP	5.7				X	X			X			X			Dead Tree (next to outhouse)	
8	250° 73' FR	PP	20				X	X			X			X			Dead top	

1 Sketch map on reverse side.

2 Probability of a tree failing within the next 5 years.

3 Probability of a tree hitting a potential target.

PP = Ponderosa pine

TREE HAZARD EVALUATION

EXHIBIT 8

Administrative unit Bradshaw RD

Examined by TODD S&R.

Site name Granite Basin Picnic Grounds

Date 8-2-89

Campground or Picnic Unit No.	Tree location (azimuth and distance from fixed object)[1] Abbreviations: TO=Toilet TB=Table FR=Fire ring PP=Parking pad TP=Tent Pad WH=Water hydrant BG=Bridge TC=Trash can TD=Trailer dump	Species	D.b.h.	*See abbreviations Type of defect: Leaning (angle of lean °)	Uprooting, root rot, butt rot, basal cavity	Bole wounds, bole cankers, decay (conks)	Weak fork, limb defect, brooms, dead top	Potential targets: Permanent structure, parked vehicle, people	Temporary structure, high-use trails	Low-use trails, signs	Failure rating[2]: High	Medium	Low	Risk rating[3]: High	Medium	Low	Additional comments *Defect abbreviations: RR=Root rot BR=Bole or butt rot BW=Bole wound BC=Basal cavity LD=Limb defect WF=Weak fork C=Conk(s) DT=Dead top ER=Exposed roots	Actio
3	TB 169° 30'	EO	14				X	X				X		X			Dead top	
4	TB 20° 38'	LP	21.5				X	X				X		X			Dead top & Limbs	
	1																	

1 Sketch map on reverse side.
2 Probability of a tree failing within the next 5 years.
3 Probability of a tree hitting a potential target.

EO = emory oak
LP = Lombardy poplar

11

4

TREE HAZARD EVALUATION

Administrative unit Bradshaw RD

Examined by TODD R&S

Site name Thumb Butte Picnic Area

Date 8-2-89

Campground or Picnic Unit No.	Tree location (azimuth and distance from fixed object)[1]	Species	D.	*See abbreviations Type of defect: Leaning (angle of lean °)	Uprooting, root rot, butt rot, basal cavity	Bole wounds, bole cankers, decay (conks)	Weak fork, limb defect, brooms, dead top	Potential targets: Permanent structure, parked vehicle, people	Temporary structure, high-use trails	Low-use trails, signs	Failure rating[2]: High	Medium	Low	Risk rating[3]: High	Medium	Low	Additional comments	Action
	Abbreviations: TO=Toilet, TB=Table, FR=Fire ring, PP=Parking pad, TP=Tent Pad, WH=Water hydrant, BG=Bridge, TC=Trash can, TD=Trailer dump																*Defect abbreviations: RR=Root rot, BR=Bole or butt rot, BW=Bole wound, BC=Basal cavity, LD=Limb defect, WF=Weak fork, C=Conk(s), DT=Dead top, ER=Exposed roots	12
Brown picnic																		
Trea B	TB 50° 21'	BW	15.5				X	X				X		X			Dead Top	
"	TB 50° 21'	BW	10.5				|	X				|		X			" "	
"	TB 50° 21'	BW	13.5				|	X				|		X			" "	
"	TB 300° 21'	BW	19				↓	X				↓		X			" "	
14	TB 147° 15'	PP	7				X	X				X		X			Dead Top	
17	TB 360° 35'	PP	8.5				|	X			X			X			Dead Fork	
4	TB 116° 23'	PP	8.5				|	X			X			X			Dead Top	
5	TB 20° 15'	PP	12				↓	X			X			X			" "	
11	TB 147° 40'	PP	28				X	X				X		X			Dead Top	

1 Sketch map on reverse side.

2 Probability of a tree failing within the next 5 years.

3 Probability of a tree hitting a potential target.

BW = Black Walnut

PP = Ponderosa Pine

TREE HAZARD EVALUATION

Administrative unit BRADSHAW RD

Examined by TODD S&R

Site name UPPER WOLF CK - Group Camp

Date 8-2-89

Campground or Picnic Unit No.	Tree location (azimuth and distance from fixed object)[1]	Species	D.	*See abbreviations Type of defect: Leaning (angle of lean °)	Uprooting, root rot, butt rot, basal cavity	Bole wounds, bole cankers, decay (conks)	Weak fork, limb defect, brooms, dead top	Potential targets: Permanent structure, parked vehicle, people	Temporary structure, high-use trails	Low-use trails, signs	Failure rating[2]: High	Medium	Low	Risk rating[3]: High	Medium	Low	Additional comments	Action
Main	Toilet 330°, 70'	EO	7				X	X			X			X			Top ½ of tree dead	
~~Sign Post~~	230°, 75'	EO	17				X		X		X			X			Dead limbs	

Abbreviations: TO=Toilet, TB=Table, FR=Fire ring, PP=Parking pad, TP=Tent Pad, WH=Water hydrant, BG=Bridge, TC=Trash can, TD=Trailer dump

*Defect abbreviations: RR=Root rot, BR=Bole or butt rot, BW=Bole wound, BC=Basal cavity, LD=Limb defect, WF=Weak fork, C=Conk(s), DT=Dead top, ER=Exposed roots

13

1 Sketch map on reverse side.
2 Probability of a tree failing within the next 5 years.
3 Probability of a tree hitting a potential target.

* Numerous dead & dying emory oaks surrounding main group area

EO = Emory oak

TREE HAZARD EVALUATION

EXHIBIT 8

Administrative unit Bradshaw RD

Examined by TODD S&R

Site name Lower Wolf Cx

Date 8-1-89

Campground or Picnic Unit No.	Tree location (azimuth and distance from fixed object)[1]	Species	D.I.B.	*See abbreviations Type of defect: Leaning (angle of lean °)	Uprooting, root rot, butt rot, basal cavity	Bole wounds, bole cankers, decay (conks)	Weak fork, limb defect, brooms, dead top	Potential targets: Permanent structure, parked vehicle, people	Temporary structure, high-use trails	Low-use trails, signs	Failure rating[2]: High	Medium	Low	Risk rating[3]: High	Medium	Low	Additional comments	Action
	Abbreviations: TO=Toilet, TB=Table, FR=Fire ring, PP=Parking pad, TP=Tent Pad, WH=Water hydrant, BG=Bridge, TC=Trash can, TD=Trailer dump																*Defect abbreviations: RR=Root rot, BR=Bole or butt rot, BW=Bole wound, BC=Basal cavity, LD=Limb defect, WF=Weak fork, C=Conk(s), DT=Dead top, ER=Exposed roots	
4	170° 24' FR	PP	75				X	X			X			X			Dead tree	
4	170° 24' FR	PP	13				X	X			X			X			Dead top	
3	260° 70' TB	PP	26				X	X				X		X			" "	
Host	145° 27' main sign	EO	11				X		X			X			X		" "	
8	80° 3' TB	PP	64				X	X				X		X			Dead top	
12	105° 18' TB	AW	105		BC X		X	X			X			X			These trees look ready to blow over	
12	" " TB	AW	95		BC X		X	X			X			X			w/next strong wind	
16	118° 62' PP	EO	130				X		X		X				X		Dead top	

1 Sketch map on reverse side.
2 Probability of a tree failing within the next 5 years.
3 Probability of a tree hitting a potential target.

PP = Ponderosa pine
EO = Emory oak
AW = Arizona white oak

14

TREE HAZARD EVALUATION

EXHIBIT 8

Administrative unit Bradshaw RD

Examined by Todd S&R

Site name Hazlett CG

Date 8-3-89

Campground or Picnic Unit No.	Tree location (azimuth and distance from fixed object)[1]	Species	D..	*See abbreviations Type of defect: Leaning (angle of lean °)	Uprooting, root rot, butt rot, basal cavity	Bole wounds, bole cankers, decay (conks)	Weak fork, limb defect, brooms, dead top	Potential targets: Permanent structure, parked vehicle, people	Temporary structure, high-use trails	Low-use trails, signs	Failure rating[2]: High	Medium	Low	Risk rating[3]: High	Medium	Low	Additional comments	Actio
	Abbreviations: TO=Toilet, TB=Table, FR=Fire ring, PP=Parking pad, TP=Tent Pad, WH=Water hydrant, BG=Bridge, TC=Trash can, TD=Trailer dump																*Defect abbreviations: RR=Root rot, BR=Bole or butt rot, BW=Bole wound, BC=Basal cavity, LD=Limb defect, WF=Weak fork, C=Conk(s), DT=Dead top, ER=Exposed roots	15
12	FR 104° 16'	EO	11				X	X				X		X			Dead top	
8	FR 323° 38'	PP	5.5				X	X					X	X			Dead top	
7	FR 267° 14'	PP	15			X		X				X		X			Lightning Strike → Fading top	
4	FR 310° 21'	EO	14				X		X		X				X		Weak fork	

1 Sketch map on reverse side.

2 Probability of a tree failing within the next 5 years.

3 Probability of a tree hitting a potential target.

EO = Emory oak

PP = Ponderosa pine

TREE HAZARD EVALUATION

EXHIBIT 8

Administrative unit BRADSHAW RD

Examined by TODD S & R

Site name KENTUCK CG

Date 8-3-89

Campground or Picnic Unit No.	Tree location (azimuth and distance from fixed object)[1]	Species	D.	*See abbreviations Type of defect: Leaning (angle of lean °)	Uprooting, root rot, butt rot, basal cavity	Bole wounds, bole cankers, decay (conks)	Weak fork, limb defect, brooms, dead top	Potential targets: Permanent structure, parked vehicle, people	Temporary structure, high-use trails	Low-use trails, signs	Failure rating[2]: High	Medium	Low	Risk rating[3]: High	Medium	Low	Additional comments	Actio
	Abbreviations: TO=Toilet, TB=Table, FR=Fire ring, PP=Parking pad, TP=Tent Pad, WH=Water hydrant, BG=Bridge, TC=Trash can, TD=Trailer dump																*Defect abbreviations: RR=Root rot, BR=Bole or butt rot, BW=Bole wound, BC=Basal cavity, LD=Limb defect, WF=Weak fork, C=Conk(s), DT=Dead top, ER=Exposed roots	16
14	FR 20° 40'	AW	10.5				X	X				X		X			Dead top	
14	FR 43° 25'	EO	12.5				X	X					X	X			Dead top	
15	FR 83° 6'	AW	9.0				X	X				X		X			Dead top	

1 Sketch map on reverse side.
2 Probability of a tree failing within the next 5 years.
3 Probability of a tree hitting a potential target.

TREE HAZARD EVALUATION

EXHIBIT 8

Administrative unit Bradshaw RD

Examined by TODD S&R

Site name Turney Group CG

Date 8-3-89

Campground or Picnic Unit No.	Tree location (azimuth and distance from fixed object)[1] Abbreviations: TO=Toilet TB=Table FR=Fire ring PP=Parking pad TP=Tent Pad WH=Water hydrant BG=Bridge TC=Trash can TD=Trailer dump	Species	D.I.B.	*See abbreviations Type of defect: Leaning (angle of lean °)	Uprooting, root rot, butt rot, basal cavity	Bole wounds, bole cankers, decay (conks)	Weak fork, limb defect, brooms, dead top	Potential targets: Permanent structure, parked vehicle, people	Temporary structure, high-use trails	Low-use trails, signs	Failure rating[2]: High	Medium	Low	Risk rating[3]: High	Medium	Low	Additional comments *Defect abbreviations: RR=Root rot BR=Bole or butt rot BW=Bole wound BC=Basal cavity LD=Limb defect WF=Weak fork C=Conk(s) DT=Dead top ER=Exposed roots WPB: Western Pine Beetle	Actio
5	FR 270° 54'	PP	11.0						X			X			X		Dead tree WPB	17
5	FR 260° 65'	PP	13.0						X			X			X		Dead " "	
5	FR 248° 55'	PP	12.0						X			X			X		Dead " "	
5	FR 260° 40'	PP	5.5						X			X			X		Dead tree WPB	
2	FR 312° 16'	PP	5.5				X	X				X		X			Dead top	
1	TB 135° 140'	PP	16.0						X			X			X		Dead tree WPB	
1	TB 135° 144'	PP	17.0						X			X			X		" " "	
1	TB 135° 143'	PP	6.0						X			X			X		" " "	
1	TB 135° 150'	PP	7.0						X			X			X		Dead tree WPB	

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3 Probability of a tree hitting a potential target.

TREE HAZARD EVALUATION

EXHIBIT 8

Administrative unit Bradshaw RD

Examined by Todd S&R

Site name Turney Group CG

Date 8-3-89

Campground or Picnic Unit No.	Tree location (azimuth and distance from fixed object)[1]	Species	D.I.B.	*See abbreviations Type of defect: Leaning (angle of lean °)	Uprooting, root rot, butt rot, basal cavity	Bole wounds, bole cankers, decay (conks)	Weak fork, limb defect, brooms, dead top	Potential targets: Permanent structure, parked vehicle people	Temporary structure, high-use trails	Low-use trails, signs	Failure rating[2]: High	Medium	Low	Risk rating[3]: High	Medium	Low	Additional comments	Actio
	Abbreviations: TO=Toilet, TB=Table, FR=Fire ring, PP=Parking pad, TP=Tent Pad, WH=Water hydrant, BG=Bridge, TC=Trash can, TD=Trailer dump																*Defect abbreviations: RR=Root rot, BR=Bole or butt rot, BW=Bole wound, BC=Basal cavity, LD=Limb defect, WF=Weak fork, C=Conk(s), DT=Dead top, ER=Exposed roots, WPB=Western Pine Beetles	18
1	TB 135° 150'	PP	9.5						X			X			X		Dead Bark Beetles (WPB)	
1	TB 135° 154'	PP	7.5						X			X			X		Dead	
1	TB 135° 155'	PP	9.0						X			X			X		Dead	
1	TB 135° 160'	PP	15.0						X			X			X		Dead	

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